ABSTRACT OF THE DISCLOSURE

[0066]   A method for creating large numbers of high-quality optical traps in arbitrary three-dimensional configurations and dynamically reconfiguring the traps under computer control. The method uses computer-generated diffractive optical elements to convert one or more optical tweezers into one or more optical vortices. The method involves combining the optical vortex technique with the holographic optical tweezer technique to create multiple optical vortices in arbitrary configurations. The method also involves employing the rotation induced in trapped particles by optical vortices to assemble clusters of particles into functional micromachines, to drive previously assembled micromachines, to pump fluids through microfluidics channels, to control flows of fluids through microfluidics channels, to mix fluids within microfluidics channels, to transport particles, to sort particles and to perform other related manipulations and transformations on matter over length scales

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